Paparella: Volume II: Otology and Neuro-Otology

Section 1: Diagnosis of Disorders of the Ear

Chapter 2: Physical Examination of the Ear

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When performing an examination of the ear, the temptation is to introduce a speculum into the external auditory canal immediately. This temptation must be resisted until the hair has been swept back and careful inspection of the auricle has been completed. In this way, trauma, infection, and neoplasm of the auricle (see Chaps, 15, 21, and 23) will not be overlooked. When examining the auricle, attention must be given to its size, shape, and the position on the head. Some patients have no auricle, some have one that is abnormally small (microtia), and others may have an auricle that protrudes prominently from the head.

A small dimple or tract just in front of the tragus is common and is a remnant of faulty fusion of the hillocks of His. Lesions such as tophi (uric acid crystals from gout) may be found along the rim of the auricle. Rarely, the auricle becomes calcified and completely inflexible. Thickening and twisting of the cartilage may indicate an old injury, as in cauliflower ear. By pressing on the tragus and pulling upward on the auricle, one can test for tenderness in the external auditory canal - a sign of acute external otitis; in acute otitis media, movements of the external ear do not cause pain.

Ordinarily, the external auditory canal is sufficiently large so that by drawing the tragus anteriorly and the auricle upward, the meatus is spread enough to afford at least a partial view of the ear canal and the tympanic membrane. This preliminary maneuver also permits selection of the correct size of speculum. An ear speculum is used to dilate and straighten the outer or cartilaginous aspect of the external auditory canal; the largest speculum that will fit is chosen. Oval specular fit better than round ones. The speculum is inserted only into the cartilaginous canal, since this is the only part that can be stretched. The inner one-third of the ear canal is bony, and pressure here is painful.

The hand that holds the speculum also grasps the auricle and stretches it upward and posteriorly, leaving the examiner's other hand free to use a second instrument. In children, the auricle should be retracted downward to facilitate introduction of the speculum. The position of the patient's head is of great importance in the aural examination. The head must not be directly upright but should be tilted toward the opposite shoulder to compensate for the normal inclination of the ear canal. The beginner usually fails to tilt the head sufficiently and, as a result, finds that he or she is looking not at the drumhead but at the wall of the canal.

The hand-held otoscope is a useful instrument for the screening examination. It provides good light and magnification. Pneumatic otoscopy can also be performed. Its great limitations are absence of binocular vision and the inability to use instruments through it effectively.

Cleaning of the external auditory canal is a prerequisite to accurate diagnosis. It is also an important component of treatment for purulent and fungal otitis externa. Small amounts of cerumen that obscure viewing and are limited to the lateral, cartilaginous portion of the external auditory canal often can be removed with a hand-held speculum and a cerumen spoon, without using magnification. Otherwise, the operating microscope is a necessity for accurate, painless removal of cerumen, purulence, or debris.

With the patient in the supine position, the patient's head rests stably on the headrest. The examiner can comfortably rest his or her arms or hands on the patient or the chair. Holding a nonreflective speculum in the nondominant hand, the examiner can use a variety of instruments to inspect, cleanse, and manipulate in the ear. The operating microscope affords stability, magnification, and binocular vision. A variety of small suction tips, cerumen spoons, and alligator forceps and a blunt right-angle probe should be available.

Effective, painless cleaning of the external canal is an acquired skill of considerable delicacy. There is a noticeable difference in the manner in which various patients respond to cleaning of the ear canal. The normal patient does not like to have the ear canal cleaned but will tolerate it; the patient with acute external otitis may not permit any manipulations because of exquisite tenderness; the patient with chronic external otitis has an itching ear and enjoys the cleaning procedure.

The lateral cartilaginous canal should be inspected for furuncles and sebaceous cysts. Furuncles will be tender; sebaceous cysts will be painless, unless infected. Dry, flaking skin in the lateral canal associated with minimal cerumen suggests chronic seborrheic dermatitis of the canal which is often accompanied by chronic itching and repeated episodes of acute, purulent external otitis. The medial portion of the canal should be examined for the presence of granulation tissue. "Sagging" of the posterosuperior wall of the canal should be noted, as it suggests either an early subperiosteal abscess or extensive erosion by cholesteatoma. Bony exostosis should be confirmed by palpation.

Polyps of the external auditory canal may be gently manipulated to determine their point of origin. Some arise from the external canal and are secondary to chronic external otitis. Others arise from the middle ear and present through a perforation in the tympanic membrane. They are indicative of chronic middle ear disease and very often cholesteatoma. It is unwise to attempt to remove these polyps outside the operating room unless the point of origin can be clearly determined. Otherwise, inadvertent avulsion of the ossicles, especially the stapes, or damage to the facial nerve may occur. Limited biopsy is recommended if operative removal is not contemplated.

After the external auditory canal has been thoroughly cleansed and evaluated, the tympanic membrane should be carefully examined. A good way to begin the examination is to visualize the entire annulus to be certain that the complete drumhead can be seen. Sometimes the anterior and inferior portions of the annulus cannot be seen because of the overhanging wall of a prominent anterior ear canal. The pars flaccida can almost always be visualized. "Perforation"

or deep retraction of this portion of the tympanic membrane strongly suggests the possibility of cholesteatoma.

Both the long and short processes of the malleus should be seen. Occasionally the long process of the incus and chorda tympani may be seen through an especially translucent drum. Visualization of the head of the malleus or body of the incus, however, is not normal and represents bony erosion (of the scutum) as seen in cholesteatomatous conditions. Visualization of the incudostapedial joint may be indicative of retraction of the eardrum. If the tympanic membrane is adherent to the incudostapedial joint, the anatomic arrangement is termed "myringo-stapediopexy" and chronic retraction can be assumed. Care should be taken to determine that apparent perforations are *real.* Perforation may heal as a thin, "secondary" or dimeric membrane which may be difficult to identify, especially if retracted. Careful examination using the binocular microscope and pneumatic otoscopy may be required to demonstrate the secondary membrane.

The pneumatic otoscopy is useful both for the magnification it provides and for the positive and negative pressure it can create in the ear canal. Alternating changes in pressure will move the drumhead and give the examiner an idea of its mobility. If liquid is present in the middle ear, for example, the tympanic membrane moves sluggishly. An atrophic area in the drumhead may be more mobile than the surrounding normal drum. The Arnold-Bruening pneumatic otoscope may be combined with the operating microscope only if the nonmagnifying lens is used.

The color of any mass behind the tympanic membrane provides important information for differential diagnosis. White masses are most likely cholesteatomatous but may indicate tympanosclerosis, adenoma, neuroma, or rarely a bony osteoma. Palpation may be helpful. A high jugular bulb will generally present as a very dark, blue mass with a clear superior margin. Chemodectomas (glomus tumors) will be dark red masses. Pressure with the pneumatic otoscope may cause blanching of a chemodectoma, and this is termed a positive Brown's sign.

Examination of patients who have had prior surgical procedures on the ear may present special problems, especially if a "canal wall down" procedure has been performed. The type of procedure done (radical vs. modified radical) should be determined. An assessment of meatal size and its adequacy is made. The facial ridge is identified and its height noted. The presence or absence of a tympanic membrane is noted and is inspected for retraction, lateralization, perforation, and ossicular landmarks. Debris is carefully removed.

A search should be made for recurrent cholesteatoma, areas of osteitic bone, and residual air cells. If the entire cavity cannot be visualized and cleaned, it is an inadequate cavity. Care must be taken around the semicircular canals, facial nerve, and oval window because anatomic integrity may be compromised, and vertigo, hearing loss, or damage to the facial nerve may result. The examiner should always remember that clear fluid in a mastoid cavity may represent cerebrospinal fluid, and soft tissue may represent brain.

Tuning Fork Tests

No otologic examination is complete without some assessment of the auditory system. Several simple modalities are available for office use that can alert the examiner to unknown difficulty, verify suspected difficulty, or confirm audiologic testing. The frequency most commonly tested with tuning forks is 512 Hz, but useful information can be obtained using 1024 Hz and 2048 Hz. Frequencies below 512 Hz can easily be *felt* as a vibration and are not useful in testing hearing.

In 1825, Ernest and Wilhelm Weber published their study on transmission of sound and air waves. In the Weber test, the vibrating tuning fork is placed firmly on a solid, midline structure (glabella, nasal dorsum, vertex, central incisors of mandible or maxilla, or mandibular symphysis) which has the capacity to conduct sound-energy to the end-organ (cochlea). The patient reports perception of sound as right, left, or midline. A patient who hears the tuning fork more clearly in one ear is said to have "lateralized" his Weber; with the 512-Hz fork, this occurs with about 15 dB of conductive hearing loss. In general, sound conducted in this manner will be lateralized toward a conductive hearing loss and away from a sensorineural hearing loss. Therefore, a unilateral hearing loss with the sound lateralized to the better ear suggest a contralateral sensorineural hearing loss, whereas sound lateralized to the poorer ear suggests an ipsilateral conductive hearing loss. Mixed hearing loss and combinations of hearing loss from one ear to the other will give a less exact result.

In 1855, Rinne pursued and elaborated upon the work of the Webers. He concluded that when a patient with hearing loss could head a sound transmitted by bone as long or longer than sound transmitted by air, then the defect was one of the conductive apparatus. If, conversely, the sound transmitted by air could be heard in the deaf ear longer than that transmitted by bone (as was the case in the normal), then the loss was sensorineural. The Rinne test is performed by first placing the vibrating tuning fork firmly against the mastoid process of the ear being examined and then either comparing its loudness (bone conduction) with that for the tuning fork placed just outside the external auditory canal (air conduction), or waiting until the sound conducted via the mastoid process can no longer be perceived and immediately moving the vibrating tuning fork to a position just outside the external auditory canal.

Bone conduction greater than air conduction (negative Rinne) suggests a conductive hearing loss, whereas air conduction greater than bone conduction (positive Rinne) suggests normal hearing or a sensorineural hearing loss. The terminology is confusing, because a positive Rinne test is a *normal* response. It is often better to record results simply as air conduction greater than bone conduction (AC > BC) or vice versa (BC > AC). A patient who has BC > AC is said to have "converted" his Rinne. Approximately 20 dB of conductive hearing loss is required before bone conduction will become greater than air conduction.